Course unit English denomination	String theory, supersymmetry and supergravity
SS	**FIS/02**
Teacher in charge	Fabio Apruzzi Gianluca Inverso
Teaching Hours	24
Number of ECTS credits allocated	3
Course period	March - June 2026
Course delivery method	☒ In presence ☐ Remotely ☐ Blended
Language of instruction	English
Mandatory attendance	☒ Yes (50% minimum of presence) ☐ No
Course unit contents	String theory is a theory of quantum gravity which is currently the best candidate for a UV completion of the presently tested models of the fundamental interactions. It can be used to answer questions sensitive to the Planck scale; it provides a set of lower energy effective field theories which are relevant for phenomenology, putting constraints on models of cosmology and particle physics beyond the standard model. It has produced several ground-breaking results: the microscopic description of the Bekenstein-Hawking entropy of black holes, the AdS/CFT correspondence (that is, the holographic description of strongly coupled quantum field theories), the discovery of large families of non-perturbative “dualities" between apparently unrelated quantum theories, and many others. The aim of this course is to explain the basic principles of string theory, supersymmetry and supergravity, and to discuss their applications. The program, which can be adapted to the background of the students, consists in an introduction to perturbative string theory, the formalism of supersymmetric gauge theories and supergravity, superstring effective actions, D-branes and dualities, holography and phenomenological applications.
Learning goals	The aim of this course is to develop an understanding of the basic principles of string theory, supersymmetry and supergravity, and their applications. Students will acquire the tools to perform supersymmetry calculations, in the construction of string theory effective actions, understand the basics of flux compactifications, the relation between brane systems and gauge theories, and the study of non-perturbative effects and dualities within these

	frameworks.
Teaching methods	Lecture s
Course on transversal, interdisciplinary, transdisciplinary skills	☐ Yes ☒ No
Available for PhD students from other courses	☐ Yes ☒ No
Prerequisites (not mandatory)	General Relativity, Quantum Field Theory
Examination methods (if applicable)	Presentation on a topic relevant to the course and to the student's research project
Suggested readings	Polchinsky "String Theory"; Green–Schwarz–Witten "Superstring Theory"; Freedman–Van Proeyen "Supergravity", Dall'Agata–Zagermann "Supergravity, From First Principles to Modern Applications"
Additional information	

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